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July 11, 1997

To: Delta Protection Commission

From: Margit Aramburu, Executive Director

Subject: Final Report; Governor's Flood Emergency Action Team, May 10, 1997

Background:

In January of this year, much of the State of California suffered extensive precipitation and flooding. In early January, the Governor, by Executive Order, set up a Flood Emergency Action Team (FEAT) and directed FEAT to prepare a 30 Day and a 120 Day report. The Commission received a briefing on the 30 Day report at its March meeting and approved a letter to be submitted to FEAT. In addition, several Commissioners and staff participated in the regional work shop held in Walnut Grove on April 21, 1997.

The 173-page report describes the status of actions from the 30-Day report, includes recommendations, reviews the January floods, describes emergency management system response to floods, outlines floodplain management issues, describes flood control system improvements, and addresses funding issues. More specific and detailed information is included in the several appendices.

To Obtain Copies of the 120 Day FEAT Report:

To obtain a complete copy of the FEAT report, contact the Department of Water Resources' Bulletins and Reports Department at (916) 653-1097. The report is available at no cost.

Excerpts of the 120 Day Report:

Attached are excerpts from the 120 Day report including: Final FEAT Recommendations and the section on the Sacramento-San Joaquin Delta.

Note that the final recommendations include:

* Development of a plan for emergency closures of the Delta waterways during periods of extremely high water (page 12).

* Improved processes to facilitate levee and river channel maintenance (page 16).

* Development of guidelines to anchor marinas (page 17).

Status of Key Delta Proposals:

Department of Boating and Waterways has submitted a request for a formal Attorney General's opinion regarding its authority over Delta waterways. Once the extent of the Department's authority is defined, development of a plan can proceed.

The Commission and several agencies and districts on the Commission participate in the Delta Levees Habitat Advisory Committee which has been working on issues of levee and channel maintenance for several years.

Department of Boating and Waterways staff is already preparing guidelines to enhance safety and stability of marinas; this task was begun partly as a result of the RD-County-State-Federal work group which met to address specific issues in the Cosumnes and Mokelumne Rivers in the Primary Zone of the Delta.

Recommendations:

Staff recommends that a letter of thanks be sent to the Governor and the FEAT over the Chairman's signature for the work of the Team.

III. Final FEAT Recommendations to the Governor

This report is not a statewide flood management report because the January 1997 floods primarily impacted the Central Valley region of the State, some localized streams on the east side of the Sierra Nevada, and the Napa and Russian rivers. Consequently, recommendations made in this report are not intended to address all statewide flood control issues.

The previous chapter detailed progress made as a result of actions taken in response to the FEAT's recommendations in the 30-day report. This final report affirms and builds on those initial recommendations and provides a framework for preparing for future flood events by presenting recommendations in four major areas: (1) needed improvements in emergency response capabilities; (2) floodplain management; (3) flood control system restoration and improvement; and (4) recommendations for further studies and investigations. Many of these can be accomplished administratively and some will require special legislation.

Emergency Response Recommendations

The following FEAT recommendations are actions that will improve flood emergency response capabilities and management of the flood control systems.

Improve Local Maintaining Agency Emergency Response Coordination and Operations

Directs the Governor's Office of Emergency Services to develop and test guidelines that clarify how federal, State, and local agencies will coordinate joint field emergency operations under its Standardized Emergency Management System. The guidelines should integrate local agencies that maintain levees and flood control structures into the overall emergency response organization. These guidelines must define fiscal responsibilities, emergency response, and statutory and regulatory authorities. (See Chapter V, Section C.)

Local Maintaining Agency Emergency Plans

Encourage local agencies responsible for maintaining levees and flood control structures to coordinate an emergency plan and response actions with the appropriate city and county emergency management agency. (See Chapter V, Section C.)

Model Emergency Procedures

Directs the Department of Water Resources, in coordination with OES, to develop model emergency procedures and training for use by local maintaining agencies in developing local plans. (See Chapter V, Section C.)

Alerting and Warning Exercises

Directs OES and DWR to jointly conduct flood emergency workshops annually, prior to the flood season. This effort will focus on the dissemination of critical information to decision makers and effectively using the tools available for conveying emergency information to the public in a timely manner. (See Chapter V, Section C.)

Improve Evacuation Procedures for Mobile Home Parks in Floodways

Directs OES to review the efficiency of mobile home and recreational vehicle park evacuations during the 1997 flood and take actions necessary to improve evacuation procedures for future flood events. (See Chapter VI, Section C.)

Livestock and Pet Evacuation

Directs OES, in cooperation with local animal control officers, the Department of Food and Agriculture, and UC Cooperative Extension, to review procedures for livestock and pet evacuation and develop animal safety and relocation procedures to be used in future emergencies. (See Chapter V, Section C.)

Sacramento–San Joaquin Delta Waterways—Emergency Response

Directs OES and the Department of Boating and Waterways, in cooperation with the U.S. Coast Guard and the Delta Protection Commission, to develop a plan of action for future emergency closures of the Sacramento–San Joaquin Delta waterways to nonessential vessel traffic during periods of extremely high water. (See Chapter V, Section D.)

Response Information Management System

Directs OES to explore the feasibility of developing RIMS for application to local governments which currently do not have access to it.. (See Chapter V, Section C.)

DWR Emergency Management

Directs the Department of Water Resources to establish a Department–wide emergency management function to better meet the requirements of the State's Emergency Services Act and the Standardized Emergency Management System. More emphasis should be placed on advance planning for all types of emergencies, and year–round coordination with OES and other local, State, and federal responding agencies. (See Chapter V, Section C.)

Disaster Assistance Funding Guidance

Directs OES to provide guidance about disaster assistance funding. This includes developing guidelines and training to clarify the responsibilities and benefits of emergency proclamations and declarations. To support this effort, OES will also develop a federal and State disaster assistance program matrix describing types of assistance provided, application requirements, time–frames, and restrictions. (See Chapter V, Section C.)

Flood Center Event Tracking and Computer Mapping

Directs DWR to assure that computer-based flood event tracking and reporting systems are completed, maintained, and staffed, including training of staff used only in emergencies. (See Chapter V, Section C.)

Multi-Party Agreement on Payment

Directs OES to coordinate, consistent with FEMA guidelines for reimbursable costs, a multi-party agreement among affected parties, at the local, State, and federal levels, addressing payment for flood emergencies and pre-emergency flood response. (See Chapter V, Section C.)

Authority to Fund Capital Outlay

Recommends that legislation be enacted authorizing the Department of Finance to use Section 8690.6 for allocation of funds for disaster related capital outlay projects needed to maintain essential State functions and to ensure public safety. (See Chapter VIII, Section A.)

Expand and Adequately Fund Long-Term Stream Gage Database

Urges the U.S. Geological Survey to expand its surface water data collection program and support long-term records of flows for gaging stations for more rivers and streams in California. This database is needed to define the watershed hydrology and provide statistics for critical water use decisions and more accurately define floods of a specific frequency, particularly the "100-year" event which is the basis of NFIP floodplain mapping. (See Chapter V, Section C.)

Uniform Flood Frequency Determination and Single Elevation Datum

Urges federal agencies to standardize the methodology for determining flood frequencies and to adopt a single elevation datum using English units rather than metric. (See Chapter V, Section C.)

Floodplain Management Recommendations

The January 1997 floods vividly pointed out the importance of floodplain management, particularly in the San Joaquin River basin where much of the floodplain is still relatively undeveloped. While a comprehensive watershed analysis is needed to develop a new master plan for flood management in the Central Valley, there are actions that governmental agencies can take now to minimize future flood impacts.

Additional FEMA Mapping for NFIP

Urges Congress to increase funding for FEMA's Region IX for its National Flood Insurance Program. These funds would be used to prepare and update Flood Insurance Rate Maps. (See Chapter VI, Section B.)

Improve Floodplain Mapping

Directs the Department of Water Resources to significantly improve its computer modeling and floodplain mapping capabilities to support the Reclamation Board's floodway program and FEMA's National Flood Insurance Program mapping efforts. (See Chapter VI, Section C.)

Outreach to Local Government

Directs the Department of Water Resources, in cooperation with the Reclamation Board, to implement critically needed proactive nonstructural floodplain management strategies and to strengthen its outreach to local government and landowners regarding allowable and appropriate land use within the Reclamation Board and FEMA floodways. (See Chapter VI, Section C.)

Lower Tuolumne River Floodplain Restoration

Recommends restoration of the Tuolumne River floodway width to safely convey floods twice the size of existing channel capacity by performing needed repairs and restoration. The FEAT recommends CALFED and DFG expedite funding and construction of this project. (See Chapter VI, Section F.)

Floodplain Management Task Force

Recommends the Governor appoint a ***Floodplain Management Task Force*** with broad membership from sectors of government and the affected community to examine specific issues related to State and local floodplain management and to make recommendations for improved statewide floodplain management policies by March 1, 1998 (See Chapter VI, Section C). In addition to broad management strategies, the Task Force should explicitly respond to the following recommendations:

- The FEAT recommends the Task Force, in consultation with Reclamation Board staff, review the **roles and responsibilities of the Reclamation Board** and recommend Legislative changes to be responsive to today's flood management needs in the Central Valley. (See Chapter IV, Section F and Chapter VI, Section C.)

- The FEAT recommends the Task Force review the situation that occurs when an LMA's **maintenance is deficient** and make recommendations for a course of action for the State to take to remedy the problem. (See Chapter VII, Section D.)

- The FEAT recommends that the Task Force **examine federal and State floodplain management regulations** and make recommendations for changes to the State's existing floodplain management procedures and policies that are implemented through Executive Order. (See Chapter VI, Section C.)

- The FEAT recommends the Task Force **review the Reclamation Board's Designated Floodways Program** and make recommendations as to how the program should be changed. (See Chapter VI, Section C.)

- The FEAT recommends the Task Force **develop specific multi-objective watershed planning elements that should be added to the Safety Element of the State's General Plan Guidelines** to encourage a regional/ coordinated approach for land use planning decisions. (See Chapter VI, Section C.)

- The FEAT recommends the Task Force examine the option of requiring future urban developments to **exceed the minimum National Flood Insurance Program floodplain management elevation requirements** by imposing State standards in statute. (See Chapter VI, Section C.)

- The FEAT recommends that the Task Force examine the option of imposing **mandatory flood insurance** for structures protected at less than the 200-year level of protection in statute. (See Chapter VI, Section C.)

- The FEAT recommends the Task Force develop **proactive nonstructural floodplain management strategies** which can be implemented cooperatively with local government and landowners to reduce future flood loss and curtail the spiraling cost of State and federal disaster assistance. (See Chapter VI, Section C.)

- The FEAT recommends that the Task Force **evaluate land use policies** applicable to urban development in deep floodplains (generally defined as having flood depths greater than three feet) and other high flood risk areas and make recommendations as to methods of regulation, such as **requiring notice on title**—if the parcel is in a deep floodplain, to ensure that prospective buyers are noticed of potential hazards. (See Chapter VI, Section D.)

- The FEAT recommends that the Task Force examine the advisability of requesting the Legislature to amend the State's programs for **State participation in federal flood control projects** to provide funding only for those communities that adopt and implement local floodplain management, as an incentive. (See Chapter VI, Section D.)

Flood Control System Restoration and Improvements

The following recommendations will expedite repair, restoration, and planned improvements in the Sacramento-San Joaquin flood control system. In addition to the capital outlay required, these recommendations improve ongoing maintenance which is important to provide improved operation of the flood control system and thus, need to be completed soon.

Acquisition of Flood Prone Lands in Stanislaus County

Urges the U.S. Fish and Wildlife Service to acquire these lands, in a manner which supports and advances the CALFED ecosystem restoration goals, and in cooperation with the California Department of Transportation to assure protection of existing highways. (See Chapter VII, Section A.)

West Bear Creek Floodplain Restoration Project, San Luis National Wildlife Refuge

Recommends that the Reclamation Board and the Lower San Joaquin Levee District support USFWS efforts to direct a portion of peak flows through the levees, allowing historic floodplains and wetland areas to temporarily store peak floodflows and reduce downstream flooding impacts. (See Chapter VII, Section A.)

Provide Federal Assurances

Urges the federal government to provide assurances to levee maintaining agencies and landowners, that are seeking to participate in a nonstructural solution, that levee repairs under PL 84–99 and repair of further damages occurring due to floods—before agreement on a final long–term project—will be done under PL 84–99 if a decision is made to fix the levees, rather than pursue the nonstructural alternative. (See Chapter VII, Section A.)

Levee, Channel, and Streambed Maintenance

Directs the Department of Fish and Game to develop a process through regulation to facilitate levee and river channel maintenance and, using the federal Fish and Wildlife Coordination Act, assist private and public entities with biological information necessary to secure federal approvals for levee and streambed maintenance activities. (See Chapter VII, Section D.)

Mitigation for Ongoing Channel Maintenance

Recommends that once mitigation has been provided for restoring a channel to its design flood carrying capacity, no further mitigation should be required for work done in the future to maintain the channel to that capacity. (See Chapter VII, Section D.)

Enforcement of Maintenance Agreements

Recommends the Reclamation Board use its authority to enforce its agreements with local maintaining agencies; those agreements allocate responsibility for flood control maintenance to the LMAs. (See Chapter VII, Section D.)

Ensure Integrity of the Sacramento River Flood Control System

Directs the Department of Water Resources to ensure continued capability of the Sacramento River Flood Control System to safely pass design floodflows by directing maintenance activities to critical areas and accelerating flood control levee and structure repairs in State–maintained areas. (See Chapter VII, Section D.)

Project Inspection Services

Recommends the Reclamation Board help ensure appropriate levee maintenance practices are carried out by requesting the Department of Water Resources to increase its monitoring of local maintenance activities. These efforts will also help maintain control of encroachments. (See Chapter VII, Section D.)

Increase Dam Safety Inspections

Directs the Department of Water Resources to inspect all dams which made large spillway releases during the 1997 flood for damage that may impair the dam's ability to safely pass future floodflows. If necessary, require the owner to initiate repairs as soon as possible to assure downstream safety. (See Chapter IV, Section G.)

Anchoring Marinas

Directs the Department of Boating and Waterways, in cooperation with the Reclamation Board and other affected agencies, to develop engineering and construction guidelines to be applied in the design, permitting, construction and/or replacement of marinas and other in-water boating structures that are subjected to high velocity flows and flood stages. (See Chapter V, Section D.)

Fully Utilize Existing Corps' Authorities for Flood Repairs

Urges the U.S. Army Corps of Engineers to use PL 84-99 authority to repair levee damage caused by seepage and piping of levee and foundation materials through boils, and to use PL 84-99 authority, in addition to Sacramento River Bank Protection Project authority, to quickly repair eroded banks that threaten levees or other public infrastructure. (See Chapter IV, Section D.)

Systemwide Benefit Approach for Levee Reconstruction

Recommends federal legislation directing the Corps to repair, based on a systemwide benefit to cost ratio analysis, all project levees and other project features of the Sacramento River Flood Control Project. (See Chapter VII, Section B.)

Sacramento River Bank Protection

Recommends the State Reclamation Board be provided funds for the Sacramento River Bank Protection Project. This ongoing program will increase the Corps' capability to reduce damage to levees. The increased level of funding in 1997-98 is also needed in FY 1998-99 to continue support of this program. (See Chapter VII, Section B.)

Congressional Authorization for Third Phase, Sacramento River Bank Protection Project

Urges Congress to provide the Corps authorization to complete environmentally-sound bank protection, in a manner consistent with CALFED ecosystem restoration goals, for eroding banks for the Sacramento River Bank Protection Project. (See Chapter VII, Section B.)

Federal Adoption of Butte Basin Plan of Flood Control

Urges the Corps to formally recognize the importance of the Butte Basin Overflow Area by adopting the overflow and bank protection features into the Sacramento River Flood Control Project, extending the project limits north to Chico Landing to match the limits of the Sacramento River Bank Protection Project, and approving a plan of flood control for the Butte Basin Overflow Area reach of the river. (See Chapter VII, Section B.)

Cache Creek Settling Basin

Recommends the Reclamation Board support the Corps by acting as the nonfederal sponsor for constructing outlet improvements needed to complete the Cache Creek Settling Basin Enlargement Project. This additional work is necessary to correct conditions affecting drainage for the city of Woodland. (See Chapter VII, Section B.)

West Sacramento Project

Recommends the Reclamation Board continue to support the U.S. Army Corps of Engineers by acting as the nonfederal sponsor for funding additional repairs to the West Sacramento Project caused by flood damage to the Yolo Bypass east levee in West Sacramento and the Sacramento Bypass south levee during the 1997 floods. (See Chapter VII, Section B.)

Mid-Valley Levee Reconstruction Project

Recommends the Legislature fund the Reclamation Board to accelerate the Mid-Valley Area Levee Reconstruction Project. This will allow the Corps to proceed with damage repairs and improvements on levee sections along the Sacramento River Flood Control Project that do not currently meet federal design standards. (See Chapter VII, Section B.)

Mallott Road Bridge; Goose Lake FRS; Chester Project

Directs the Department of Water Resources to undertake the following minor capital outlay for flood control projects: constructing a concrete bridge at Mallott Road Crossing in Sutter County; improving escape flows at the Goose Lake Flood Relief Structure in Butte County; and providing State match for funding repairs and modifications to the diversion dam and fish ladder on the north fork of the Feather River near Chester in Plumas County. (See Chapter VII, Section B.)

Private Levees

Directs the Department of Water Resources, as it becomes aware of a private levee which provides some flood protection and for which there is no maintaining agency, to notify the appropriate local government entity regarding that levee. This is in response to the January 1997 floods, which highlighted the existence of such levees. This will allow residents who receive benefits from such levees to organize and decide as a group whether to take steps to improve the levees to meet Corps standards or to pursue nonstructural alternatives. (See Chapter VII, Section C.)

The following potential FY 1998–99 support and capital outlay projects need funding:

Colusa Bypass Sediment Removal

Recommends the Legislature provide Department of Water Resources funding to remove sediment build–up within the Colusa Bypass. Sediment deposits have reduced the flow capacity of the bypass and the efficiency of the flood control system by forcing flows to remain in the Sacramento River. (See Chapter VII, Section B.)

Lower Sacramento Area Levee Reconstruction Project

Recommends the Legislature provide the Reclamation Board funds to support the Corps construction of necessary levee repairs under Phase IV of the Sacramento River Flood Control System Evaluation. This project is continuing work begun and funded in FY 1997–98. (See Chapter VII, Section B.)

Tisdale Bridge Replacement

Recommends the Legislature provide funds for the Department of Water Resources in cooperation with Sutter County and the Department of Transportation to remove and replace the State–owned bridge at Tisdale Weir. This bridge collects debris and impedes flows into the Tisdale Bypass resulting in unnecessarily high Sacramento River flows. (See Chapter VII, Section B.)

American River FCP–Common Elements (Phase I)

Recommends the Legislature provide funds to the Reclamation Board for the State's share of the American River Flood Control Project. This work will construct levee stabilization measures common to all three alternatives formulated by the Corps for long–term flood control improvements, has been authorized by Congress, and is the first increment of a comprehensive flood control plan for the City of Sacramento. (See Chapter VII, Section B.)

Eastside Bypass on Lower San Joaquin River

Recommends the Legislature provide funding to restore subsided levees of the State–constructed Eastside Bypass to restore the bypass floodflow carrying capacity. (See Chapter VII, Section C.)

Recommendations for Further Studies and Investigations

Although this report makes a number of recommendations for immediate action, these are many outstanding statewide issues related to flood management for which more information and analysis are required before resolution can be reached. The following recommendations emphasize the ongoing need for such studies and investigations.

Yuba River Feasibility Study

Recommends the Legislature fund the Reclamation Board to support the Corps flood control feasibility study of the Yuba River Basin and the State's share of Preconstruction Engineering and Design work. A higher level of flood protection is needed for the urban areas of Linda/Olivehurst/Arboga. (See Chapter VII, Section A.)

Tuolumne River Reconnaissance Study

Urges Congress to provide funding to support the U.S. Army Corps of Engineers' preparation of a reconnaissance study to investigate long-term solutions to flooding problems along the Tuolumne River and Dry Creek. All potential structural and nonstructural solutions should be addressed in the investigation. (See Chapter VII, Section A.)

American River FCP—Long-Term Improvements

Recommends the Reclamation Board, the Corps, and the Sacramento Area Flood Control Agency should continue working to develop and implement long-term American River flood control improvements providing at least 1 in 200 year protection to the city of Sacramento. (See Chapter VII, Section B.)

Sacramento River and San Joaquin River Comprehensive Watershed Management Studies

Recommends the Legislature authorize the Reclamation Board to act as the nonfederal sponsor and support the U.S. Army Corps of Engineers, working collaboratively with the CALFED structure to complete comprehensive watershed management studies in the Sacramento and San Joaquin river basins, ensuring that the full range of structural and nonstructural flood damage reduction measures are considered in developing a new master plan for flood control in the Central Valley. These studies will take four years to complete and require continued funding beyond the current fiscal year. (See Chapter VII, Section C.)

Evaluate Debris Commission Projects

Directs DWR to cooperatively work with the Reclamation Board and the Corps to define responsibilities and authorities for maintaining projects constructed by the California Debris Commission. DWR should report on options and recommend repairs and improvements to be cost shared with the Corps, as appropriate, based upon the findings of the evaluations. (See Chapter VII, Section C.)

Ditch and Canal Setbacks

Directs DWR to work closely with the Corps and the Reclamation Board to evaluate the effect of ditches and canals near levees and, where necessary, to work with local agencies and property owners to set the ditches and canals back from the levee wherever levee integrity is threatened. (See Chapter VII, Section C.)

Evaluate Effects of Vegetation on Levees

Urges Congress to provide funding for the Corps to expedite evaluation of the effects of vegetation on levees and in bank protection. The Corps was directed in the Water Resources Development Act of 1996 to perform this evaluation and report on it within 270 days, but Congress has not provided specific funding for this activity. (See Chapter VII, Section D.)

State Participation in Feasibility Studies

Recommends the Legislature provide funding to DWR and CALFED to allow the State to fully participate in feasibility studies of flood damage reduction projects in the Central Valley, working collaboratively within the CALFED structure, to ensure that the full range of structural measures as well as nonstructural measures are considered. (See Chapter VII, Section A.)

Needed University Research

Recommends the University of California, to the extent federal funds are made available, increase its research efforts in the areas of climate prediction modeling and long-range weather forecasting, and floodplain management. (See Chapter IV, Section A.)

Inventory Flood Control Agencies

Directs the Department of Finance to develop an inventory of federal, State, and local agencies involved in flood control efforts and/or related environmental regulation. Such an inventory could be helpful in the coordination of the many agencies concerned with flood control. (See Chapter VIII, Section C.)

Table III–1. FEAT Recommendations for FY 1997–98
(in thousands of dollars)

	General Fund	Personnel Years
Support Proposals – Special Legislation		
Flood Center Event Tracking and Computer Mapping	450	3.8
Ensure Integrity of the Sacramento River Flood Control System	950[1]	8.5
Proactive Floodplain Management	2,150	7.6
Improvement of Inspection Services	340	2.8
Increase Dam Safety Inspection	475	2.8
Subtotal	**4,365**	**25.5**

	General Fund	Reimbursable Authority	Federal Participation
Major Capital Outlay – Special Legislation			
Sacramento River Bank Protection Project	500[2]	—	Yes
Yuba River Feasibility Study	775	—	Yes
Sacramento River Watershed Management Study	500	—	Yes
San Joaquin River Watershed Management Study	500	—	Yes
Cache Creek Settling Basin	700	—	Yes
West Sacramento Project	140	60	Yes
Mid–Valley Levee Reconstruction Project	840	360	Yes
Subtotal	**3,955**	**420**	
Minor Capital Outlay – Special Legislation			
Mallott Road Bridge Construction	250	—	No
Goose Lake Flood Relief Structure Reconstruction	250	—	No
North Fork Feather River Project near Chester	250	—	Yes
Subtotal	**750**		
Total for 1997–98	**$9,070**		

[1] *Supplements funding of $450,000 already included in the 1997–98 Governor's Budget.*

[2] *Supplements funding of $2,000,000 already included in the 1997–98 Governor's Budget.*

Table III–2. FEAT Recommendations for FY 1998–99
(In thousands of dollars)

	Potential 1998–99 Amount Required			
	General Fund	Reimbursable Authority	Estimated Future State Costs	Federal Participation
New State Operations Proposal for 1998–99				
Colusa Bypass Sediment Removal	4,100	—	0	No
Subtotal	**4,100**	—		
New Major Capital Outlay for 1998–99				
Eastside Bypass, Lower San Joaquin River	2,000		0	No
Tisdale Bridge Replacement	1,800		0	Yes
Subtotal	**3,800**			
Continuation of 1997–98 Capital Outlay Programs				
Lower Sacramento Area Levee Reconstruction Project	700	300	0	Yes
American River FCP–Common Elements (Phase 1)	7,630	3,270	1,060	Yes
Sacramento River Bank Protection Project	2,500	—	Continuing	Yes
Yuba River–Preconstruction Engineering and Design	210	90	7,700	Yes
Sacramento River Watershed Management Study	1,400	—	2,100	Yes
San Joaquin River Watershed Management Study	1,500	—	2,500	Yes
Subtotal	**13,940**	**3,660**		
Total Potential 1998–99	**21,840**	**3,660**		

VII Flood Control System Improvements

As stated earlier (under the Sacramento River section of this chapter), the FEAT recommends that once mitigation has been provided for restoring a channel to its design flood carrying capacity, no further mitigation should be required to maintain the channel to that capacity.

Other Nonstructural Measures. The purpose of nonstructural measures is to reduce flood damages rather than controlling floodwaters. Nonstructural measures may include such physical activities as relocating, elevating, flood proofing, or constructing floodwalls or levees to protect individual or small groups of structures. They can also include regulations or policies such as floodplain zoning in the National Flood Insurance Program, and flood warning and preparedness planning. See Chapter VI for a more detailed discussion on nonstructural measures.

In addition, a basin–wide nonstructural measure would involve optimizing the operation of all existing reservoirs in the basin to improve flood protection to downstream areas consistent with other authorized purposes.

Acquisition/Relocation of Structures. This alternative is to acquire or relocate the structures or land located in the flood–prone area to establish a long–term solution for the floodplain management. FEMA's 100–year floodplain guidelines may be used for this alternative. An integrated program of habitat and managed agriculture may be implemented. The major benefits of this alternative are as follows:

- Reduce the risk of property damage and resulting exposure to liability
- Habitat development to advance programs such as the CALFED and CVPIA efforts
- Potential rental income on acquired agricultural ground to offset management and other maintenance costs
- Potential to integrate agricultural and wildlife plans
- High recreational potential

However, the January 1997 flood on the lower San Joaquin River likely exceeded the 100–year flood.

As stated earlier in Section C, the FEAT recommends that a full range of structural and nonstructural flood damage reduction measures be considered in the comprehensive water management studies.

3. Sacramento–San Joaquin Delta

The Sacramento–San Joaquin Delta is the hub of water supply infrastructure and provides valuable resources and without adequate levees, the Delta as we know it today will be lost. The levees serve many diverse needs. They protect valuable wildlife habitat, farms, homes, urban areas, recreational developments,

highways and railroads, natural gas fields, utility lines, major aqueducts, and other public developments. The levees are also critical to protecting Delta water quality and serve a significant function in the State's water transfer system. In the Delta Flood Protection Act of 1988 (SB 34), the Legislature declared "...that the delta is endowed with many invaluable and unique resources and that these resources are of major statewide significance."

Since reclamation of the Delta began in the 1800s, the levees have increased from under 5 feet to over 25 feet in height. Due to subsidence of the island interiors, it has been necessary to continually add material to hold back the adjoining rivers and sloughs. Since many of the levees were built piecemeal over many decades with little understanding of the engineering challenges posed by the Delta's geology and the impacts of long-term subsidence, there has been an ongoing concern over the performance of these levees.

Levee conditions in the Delta are quite different from those in many other locations, where land elevations are above normal water levels. In these other locations, water forces act on levees only during periods of high water or flooding. In the Delta, land elevations are generally much lower than waterway elevations. Because of this difference, the levees function more as earthen dams which act as continuous water barriers. This difference between many Delta levees and levees in other areas has important implications regarding levee design and reconstruction. For example, most of the Delta levees have to remain fully functional during any improvements or rehabilitation.

Levee failures continue to be one of the Delta's primary problems. Levee failures in the Delta are due to several factors which include instability, overtopping, and seepage. To gain a better understanding of the problems facing the Delta, DWR has undertaken engineering investigations such as a recently completed seismic analysis of the Delta levees. These investigations along with levee improvement projects performed under SB 34 have demonstrated that many difficult Delta levee problems are solvable. SB 34 has provided the necessary focus for coordinated levee engineering investigations and funds for improvement projects that have advanced the state of the art of levee design. These efforts have demonstrated that levees can be engineered to alleviate the unfavorable conditions which continue to threaten this water hub of unique economic and natural value. SB 34 programs have also significantly advanced the understanding of Delta subsidence, its causes, and the importance of integrating subsidence control with levee improvements.

Maintenance and improvement work is vital to the protection of the island itself and the habitat existing on the island. The importance of the Delta as habitat can be seen in its increased use by waterfowl. With the dwindling wetland habitat throughout the State, the winter use by Delta waterfowl has increased from 0.5 million birds 20 years ago to about 1.5 million today.

Improvements being made on extremely fragile levees in the western Delta have been completed using an innovative design. Even after accounting for recreation and maintenance, these costs are significantly less than the estimates made over 10 years ago to repair the same levees to essentially the same standards. Use of new designs, extensive monitoring, economical borrow sources, and the beneficial reuse of dredge material are all factors which need to be considered in developing realistic future costs.

However, rehabilitation costs exceed the financial resources of most Delta landowners. Funding through Senate Bill 34, enacted in 1988, has provided for significant levee improvements, but is insufficient to properly rehabilitate all Delta levees. Therefore, a comprehensive cost sharing arrangement needs to be established which will address benefits and equitable cost sharing among all the beneficiaries. Cost sharing arrangements similar to those being forged with the Long Term Management Strategy program to provide economical sources of levee material will help to meet this objective.

Significant DWR activities focus on protecting the Delta both through emergency work and long–term planning. Senate Bill 34 allows the Department to mobilize forces to take necessary immediate action for threatened levee sites as well as provide long term improvement projects. The long term improvement projects that DWR has sponsored address the specific problems of each levee system in a flexible manner.

a. Needs Assessment

River Channel and Levee Capacities. Upstream development with flood control improvements continue to increase flows entering the Delta. The combination of increased inflows into the Delta from the Cosumnes, Mokelumne, Sacramento, and San Joaquin rivers, and reduced channel capacities from sedimentation increase the risk of flooding in the north and south Delta.

Current Level of Flood Protection. Nearly all of the levee work in the Delta is performed through the cooperative efforts of the local reclamation districts and the Senate Bill 34 program. The SB34 projects are compatible with the plan for improvement set forth in Bulletin 192–82. The high participation in the program by reclamation districts has resulted in funding to the minimum FEMA Hazard Mitigation Plan standard (one foot above the hundred year flood event), a standard that resulted from the floods of the 1980s and one that is required to receive federal disaster assistance. Nearly all Delta reclamation districts meet the HMP standard.

Developing Areas–Land Use. Cities such as Stockton, Lathrop, Tracy, Byron, and Antioch follow the overall trend of growth in California and are now encroaching into the Delta. The Delta Protection Act of 1992 was passed by the Legislature and signed by the Governor to protect the Delta Primary Zone, an area of approximately 500,000 acres.

The goals identified in the Act are to "protect, maintain, and where possible, enhance and restore the overall quality of the Delta environment, including but not limited to agriculture, wildlife habitat, and recreational activities; assure orderly, balanced conservation and development of Delta land resources and improve flood protection by structural and nonstructural means to ensure an increased level of public health and safety." To meet these goals, the Delta Protection Commission has adopted a "Land Use and Resource Management Plan for the Primary Zone of the Delta." The findings of the Plan are meant to be used by the Delta local governments to adopt into their general plans so local governments throughout the primary zone provide consistent and harmonious land use policies.

Seismic Risk. Delta levee seismic susceptibility is being explored by continuing research that began with the Department of Water Resources' Phase I Delta Seismic investigation. Since there are many unknowns regarding the dynamic properties of the peaty foundation layers which commonly exist beneath the Delta levee system, the continued research will attempt to reduce the major uncertainties by installing strong–motion accelerometers at three to four levee sites in the Delta; creating a geologic model for deeper soil deposits; undertaking field and laboratory testing to better determine the static and dynamic properties of organic soils; undertaking field and laboratory testing to better determine liquefaction potential; and investigating the potential activity of the Coast Range–Sierra /Nevada Boundary Zone. These efforts will be closely coordinated with the CALFED Bay Delta Program, USGS, UCD, and interested stakeholders. DWR, in coordination with CALFED, is investigating emergency preparedness for earthquake damage and multiple island failures.

b. Alternatives

New or Enlarged Floodways. To improve the flood carrying capacities of floodways, impediments to the flow need to be removed and/or the channel geometry needs to be enlarged. With the shortage of shaded riverine aquatic habitat (overhanging riparian vegetation such as trees and large shrubs), removing these impediments is not a viable alternative. Therefore, either increasing the channel capacity by dredging or setting back levees to allow vegetated benches that can overflow when floodflows are present are the reasonable alternatives that will not adversely impact the estuary.

Dredging channels has historically been performed as needed by reclamation districts to provide a source of material for levee construction and additional flow capacity adjacent to the island. Declines in the populations of native aquatic species such as Delta smelt and winter run salmon have resulted in Endangered Species Act listings of these species and increased regulation on activities that may have impacts on the survival of these species. Cautiously, regulatory agencies have limited dredging to a 1 1/2 month window (August 1 to Sept 14). However, the pertinent State and federal agencies that regulate dredging are formulating criteria

for dredging outside the dredging window to allow for in-water work when it is evident that the project will have not threaten endangered aquatic species.

Flexibility in regulating Delta maintenance dredging will allow more levee rehabilitation to take place, but not enough to alleviate the north and south Delta channel capacities problem.

Levee Setbacks. Setback levees are the most costly alternative for increasing channel capacity but provide the biggest benefits to the estuary. A program that would setback levees along flood prone channels would result in large riparian corridors that would benefit both aquatic and terrestrial species. The impact of these corridors would be a reduction of Delta agricultural production and terrestrial habitat such as Swainson Hawk habitat for foraging.

Acquisition/Relocation of Structures. Most western and central Delta (Primary Zone) lands are sparsely populated with most structures associated directly or indirectly with the agricultural industry. The surface of these lands lies below the adjacent water surface elevation at all times of the year. Therefore, relocating these structures within the same islands is not an acceptable alternative. A more reasonable approach to decrease the risk to Delta residents and lower disaster assistance costs would be to floodproof structures meant for habitation to National Flood Insurance Program standards. Improvements such as raising living areas out of the floodplain and leaving uninhabited structures such as garages below the living area are efficient ways of floodproofing. However, the lower structural members need to be sturdy or debris and logs will batter the dwelling to pieces.

c. Other Significant Delta Issues

Subsidence of Delta lands and the lack of suitable borrow material for levee raising and reconstruction is a significant issue in the Delta. Delta lands continue to subside requiring high levels of maintenance to provide adequate flood protection. Material to raise and stabilize these larger levees is not available within the Delta. Therefore, beneficial reuse of dredge material is a significant resource for Delta levee rehabilitation.

Subsidence control research is being performed through the coordinated efforts of DWR, USGS, and CALFED. The results of the research will be used to develop subsidence control guidelines that will be based on research into "capping" and techniques which maximize accretion through shallow water flooding. Utilizing GIS technology, parameters that have been found through ongoing research to affect subsidence (depth of peat soil, historical subsidence rates, percent organic matter and, land use), will be mapped to aid land use planning decisions for subsidence control.